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Systems Programs for the Analysis of Nonurban, Nonpoint Source Pollutants in the Missouri Basin Region. Supplement

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May 3, 1973

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SYSTEMS PROGRAMS FOR THE ANALYSIS OF NONURBAN, NONPOINT SOURCE POLLUTANTS IN THE MISSOURI BASIN REGION

Supplement: User's Manual and Computer Program Listing

by

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A program system for the analysis of nonurban, nonpoint source pollutants in the Missouri River Basin was developed at Midwest Research Institute under the sponsorship of the Environmental Protection Agency. In this program data related to nonurban, nonpoint source of pollutants were collected, evaluated, compiled, and organized. These data can be used to develop system models that can be used by EPA to assess the impact of nonpoint source pollutants on the pollution of surface water, and to facilitate long-range planning for pollution control.

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PREFACE

This report is a supplement to the Final Report and was prepared for EPA Contract No. 68-01-0159 which was monitored by Mr. Keith Snyder.

The report gives a complete listing of the computer programs developed on this contract, as well as the operating instructions for using and updating these programs.

The work was conducted in the Environmental Sciences Section of the Physical Sciences Division. The report was written by Dr. A. E. Vandegrift and Dr. S. Y. Chiu with assistance from Mr. Richard Salmon, Mr. Duane Dieckman, and Mr. Evan Stewart.

Approved for:

MIDWEST RESEARCH INSTITUTE

H. M. Hubbard, Director
Physical Sciences Division

3 May 1973

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INTRODUCTION

A program system for the analysis of nonurban, nonpoint source pollutants in the Missouri River Basin was developed at Midwest Research Institute under the sponsorship of the Environmental Protection Agency (Contract No. 68-01-0159). In this program (to date) data related to nonurban, nonpoint source of pollutants were collected, evaluated, compiled, and organized. These data can be used to develop system models that can be used by EPA to assess the impact of nonpoint source pollutants on the pollution of surface water, and to facilitate long-range planning for pollution control.

Based on the need for the development of system models, we identified the following data categories for this program: water quality, hydrology, climatology, topography, soil classification, land use, livestock distribution, fertilizer use, and pesticide use. The majority of data needed were available in a computer processible form, such as STORET (water quality and streamflow data), Census of Agriculture (land use and livestock data), Conservation Needs Inventory (land use and soil classification), and NOAA (precipitation data). Other data not available on magnetic tapes were also collected, or estimated, and put into machine readable form.

Two major computer files were produced for this program. The COUNTY MASTER FILE has one record for each of the 438 counties in the Missouri River Basin. Records for each county consist of data on land use, fertilizer and pesticide application, soil classification, livestock distribution, topography, and climatology. The STATION MASTER FILE contains information unique to an individual station and the watershed which impacts that station. In this file, the station location, the water quality and hydrological data, the area and physical characteristics of the watershed and all information available for counties in the watershed as recorded in the COUNTY MASTER FILE are compiled. Two hundred thirty three water quality stations were selected in this program. The present file has water quality and hydrological data for 1968, 1969, and 1970, and land use data for 1969. Provisions have been made for updating when new data become available.

Complete details on the determination of data needs and data sources, preliminary evaluation of data, compilation of data, conclusions, and our recommendations have been described in the Final Report. This

supplement gives a complete listing of computer programs which were used to develop the data files.

In the subsequent sections, we present the methods of data organization, methods to update data, and complete description of computer programs developed for this project.

DEVELOPING THE DATA BANKS

COUNTY MASTER FILE - County Data Bank

The County Data Bank is created from four sources. They are as follows:

Manually prepared data: The program NPSPGFM1 reads and edits the data prepared manually using the forms in Appendix A, creating magnetic tapes for use by other programs. NPSPGCM1 reads the manual data file and creates, from card Types 1 and 2, a skeleton COUNTY MASTER FILE. This program should be used only for originating the COUNTY MASTER FILE.

NPSPFPC1 reads the manual data file extracting card Types 8 and 9 and creates a disk work file which is sorted into state and county sequence by NPSPFPC2. The sorted work file from NPSPFRPC2 is read by NPSPFPC3 which updates the COUNTY MASTER FILE for the year 1969. Space is available in the COUNTY MASTER for years 1968, 1970, 1971, and 1972. A minor program change to NPSPFPC1 and NPSPFPC3 will be required if a year other than 1969 is to be updated.

NPSPNOA1 reads the manual data file selecting card Type 10 for use in correlating NOAA station numbers to their appropriate state and county.

Conservation Needs Inventory (1967): NPSPCNI2 reads the Conservation Needs Inventory files for each state and extracts the data required from each, building a disk work file by state and county. The data extracted are described in Appendix B. The disk work file is sorted into state and county sequence by NPSPCNI3. The sorted disk work file is read by NPSPCNI4 for updating the Conservation Needs Inventory data in the COUNTY MASTER FILE. The Conservation Needs Inventory data are for the year 1967 and because these data do not vary from year to year, no space is allocated for storing additional CNI data.

Census of Agriculture (1969): NPSPCOA1 reads the Census of Agriculture files for each county, extracts the required data and creates a tape work file. The data extracted are described in Appendix B. NPSPCOA2 sorts the tape work file into state and county sequence. NPSPCOA3 reads the sorted tape work file and updates the COUNTY MASTER FILE for the year 1969. Space is available in the COUNTY MASTER FILE for the years 1968, 1970, 1971, and 1972. Minor changes to NPSPCOA1 and NPSPCOA3 will be required to update years other than 1969.

National Oceanic and Atmospheric Administration (NOAA) 1968 - 1970: NPSPNOA1 reads the NOAA files and the manual data file (card Type 10) and extracts rainfall data by NOAA station and using card Type 10 data, converts the station number into the appropriate state and county. NPSPNOA1 creates a disk work file which is sorted by NPSPNOA2 into state and county sequence. NPSPNOA3 reads the sorted disk file and updates the COUNTY MASTER FILE for the years 1968, 1969, and 1970. Space is available in the COUNTY MASTER FILE for the years 1971 and 1972 when the data become available. Minor program changes to NPSPNOA1 and NPSPNOA3 will be required when data for other years are added.

STATION MASTER FILE - Watershed Data Bank

The watershed data bank receives data from water quality data (STORET), from the completed COUNTY MASTER FILE and from manually prepared data. The description of these sources follows:

Manually prepared data (1969): NPSPGSM1 reads the manual data file selecting card Types 3, 4, 5, 6, and 7 (Appendix A) which are written on a disk work file. The disk work file is sorted by NPSPGSM2 into MRI station number sequence. The sorted disk work file is read by NPSPGSM3 as well as card Types 1 and 2 from the manual data file. These two files create the skeleton STATION MASTER FILE with some constant data (described in the NPSPGSM1 program writeup).

Water quality data (STORET) (1968 - 1970): NPSPSTR1 reads a file created by using STORET which contains water quality data (see Appendix C) for all of the USGS and STORET stations in the Missouri River Basin. Card Type 4 is read from the manual data file to provide a means of correlating USGS station numbers and STORET station numbers to MRI station numbers. The mean value and the number of samples for each quarter and year, for each parameter listed in Appendix C, is extracted and written on a disk work file with the appropriate MRI station number. The disk work file is sorted by NPSPSTR2 into MRI station number sequence. The sorted work file is read by NPSPSTR3 and the appropriate data for the years 1968, 1969, and 1970 are merged into the STATION MASTER FILE. Space is available in the STATION MASTER FILE to add data for the years 1971 and 1972. Minor changes to NPSPSTR1 and NPSPSTR3 will be required if data for additional years are added.

COUNTY MASTER FILE (1969): Updating the STATION MASTER FILE with data from the COUNTY MASTER FILE is a multiphase procedure and caution must

be used in allocating county resources to a watershed region (or zone). A county may be wholly contained within a zone or may be split into many zones. Also, some data in the COUNTY MASTER FILE are allocated by a zone/county ratio (e.g., zone area/county area x county data), or a 1:1 ratio (e.g., ground slope). This is accomplished by executing NPSPGAL1 which reads card Types 2 and 5 from the manual data file and creates a disk work file for each card type. NPSPGAL2 sorts the disk work file for card Type 5 into state and county sequence while NPSPGAL3 sorts the disk work file for card Type 2 into state and county sequence. NPSPGAL4 reads the two sorted disk work files and creates a new disk work file adding the zone areas from the sum of the area field in the Type 5 card to the data already in both files. This new disk work file is sorted by NPSPGAL5 into MRI station number sequence. NPSPGAL6 reads the sorted work files and accumulates the zone area amounts for all zones assigned to a station to arrive at a station area (watershed) value. The records which have a station area computed are written onto another disk work file. NPSPGAL7 reads this disk work file and sorts it into state and county sequence and writes it on a magnetic tape which is the allocation file. The allocation file and the completed COUNTY MASTER FILE are read by NPSPCAL1 which matches on state and county and allocates the county data by the zone/county ratio, or 1:1 depending on the type of data. NPSPCAL1 then creates a Zone Master File on magnetic tape. NPSPCTS1 sorts the Zone Master File into MRI station number sequence. NPSPCTS2 reads the sorted Zone Master File and accumulates all like zones (same MRI station number) writing a disk work file with only one record for each MRI station number. NPSPCTS3 reads the disk work file and updates the STATION MASTER FILE with the county/zone data we have computed.

These steps will need to be repeated every time a change is made to the COUNTY MASTER FILE to insure that the appropriate data in the STATION MASTER are also updated.

DATA BANK REPORTS

When both data banks (COUNTY MASTER FILE and STATION MASTER FILE) are complete the contents of each may be printed by using the program NPSPCTYD for the COUNTY MASTER and NPSPSTMD for the STATION MASTER.

Figure 1 shows an overall system flowchart which represents the logical sequence of events that take place in creating and maintaining the data banks. Exact operational instructions will vary depending on the type of computer system used. All programs are written in COBOL and should be easily adaptable to any computer system.

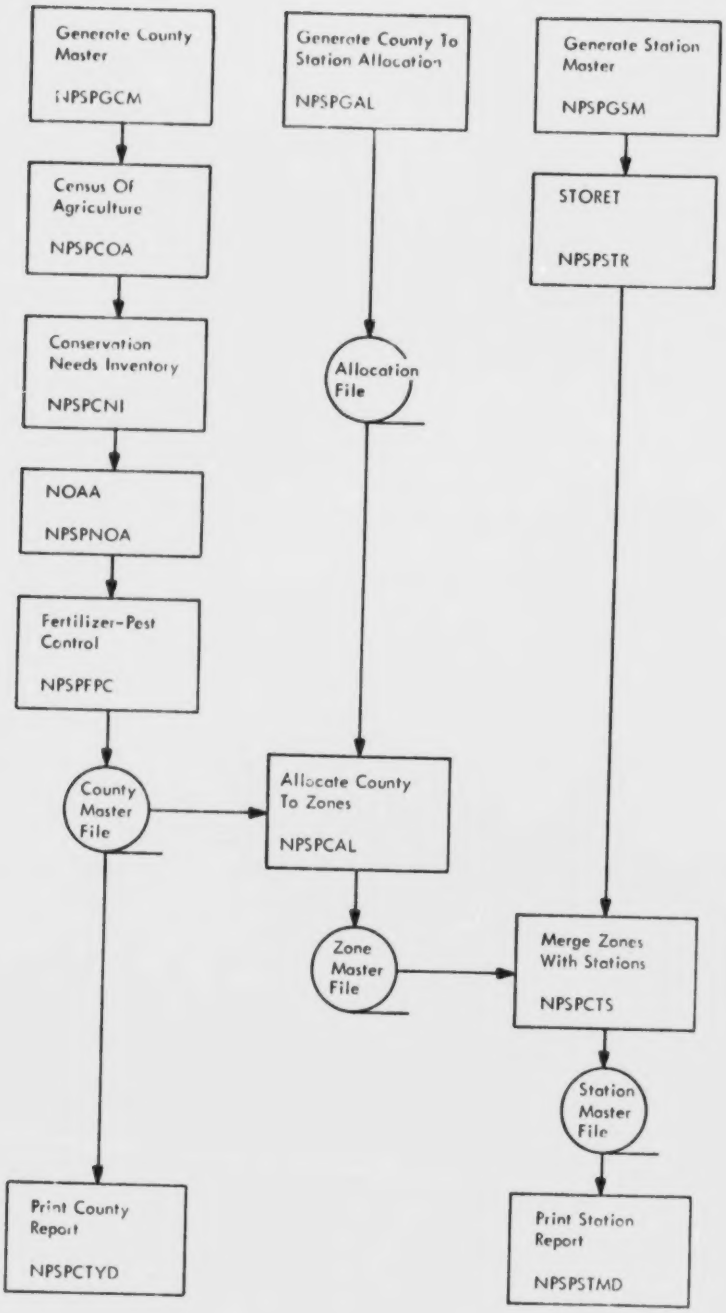

Figure 1 - System Flow Chart

PROGRAM DESCRIPTIONS

Brief discussions for each program are given in the following paragraphs and the printouts for each program are presented in Appendix E, which is a separate accompanying document.

NPSPGMF1: This program will read the various cards created manually and write them onto a magnetic tape. This provides data to the STATION MASTER FILE and the COUNTY MASTER FILE that are not available from other sources. The only purpose is so that all card input for the system will be from a central file in an easily accessible form. There are 10 different input forms, they are defined as follow:

Form Number	Description
1.	State Name and State Number
2.	County Data a. State and county codes b. Maximum 30-min rainfall. c. Soil type d. County area e. County name
3.	Station Location and Identification a. MRI station number b. State and county code c. Latitude of station d. Longitude of station e. Stream name f. Location
4.	Station Cross Reference List a. MRI station number b. STORET station number c. STORET agency number d. OWDC water-quality station number

Form Number	Description
	e. OWDC surface water station f. USGS station number g. USGS agency number
5.	Zone Within Watershed Definition a. MRI station number b. County - (Up to 100 entries) 1. State and county code 2. County area 3. County - distance to station
6.	Hydrological Sequence a. MRI station number b. Downstream MRI station number c. Mileage to downstream station
7.	Zone Slope and Soil Characteristics a. MRI station number b. Main channel slope c. Soil infiltration rate d. Soil erosion factor e. Map number and location
8.	Applied Fertilizer by County by Half Year a. State and county code b. Half year code c. Total nitrogen d. Total P_2O_5 e. Total K_2O
9.	Pesticide Data a. State and county code b. Insecticide c. Herbicides d. Fungicides
10.	NOAA Station-State County Cross Reference a. State and county code b. NOAA stations (up to 30)

NPSPGAL1: This program reads the tape created in NPSPGMF1 and extracts the data Types 2 and 5 onto intermediate data files for sorting. The sorted files will be used by NPSPGAL4 for county allocation data. NPSPGAL2 will sort Type 5 records and NPSPGAL3 will sort Type 2 records.

NPSPGSM1: This program reads the tape created in NPSPGMF1 and extracts the data Types 3, 4, 5, 6, and 7 onto intermediate data files for sorting. The sorted files are used by NPSPGSM3 in the creation of the STATION MASTER FILE. NPSPGSM2 sorts the selected records into station sequence.

NPSPGCM1: This program reads the tape created in NPSPGMF1 and selects data Types 1 and 2 for the creation of the COUNTY MASTER FILE.

NPSPFPC1: This program reads the tape created in NPSPGMF1 and extracts the data Type 8 onto an intermediate data file for sorting. The sorted file is based in NPSPFPC3 to add the fertilizer data into the COUNTY MASTER FILE. NPSPFPC2 sorts the selected records into state and county sequence.

NPSPCOA1: This program reads the Census of Agriculture tape (1969) and selects the following data which will be sorted by NPSPCOA2 for inclusion onto the COUNTY MASTER FILE in NPSPCOA3:

1. State
2. County
3. Data year
4. Land area
5. Total crop area
6. Pasture grazing
7. Woodlands
8. Irrigated
9. Total cattle
10. Total hogs

11. Corn

12. Sorghum

13. Hay

14. Cotton

15. Peanuts

16. Tobacco

17. Potatoes

18. Sheep

19. Horses

20. Total chickens

21. Chicken houses

22. Chickens in houses

23. Wheat

24. Other grain

25. Soybeans

26. Greenhouses

27. Vegetables

28. Berries

29. Orchards

30. Other crops

31. Cattle feedlots

32. Cattle in feedlots

33. Hog lots

34. Hogs in lots

35. Lime

NPSPCNI2: This program reads the Conservation Needs Inventory file sorted by NPSPCNI2 and selects the following data which will be sorted by NPSPCNI3 for inclusion in the COUNTY MASTER FILE in NPSPCNI4.

1. Land resource area

2. Land resource region

3. Soil name

4. Watershed

5. Soil classes

6. Slope percent class

7. Soil erosion class

NPSPNOA1: This program reads the NOAA tape and selects the following data whic' will be sorted by NPSPNOA2 and added to the COUNTY MASTER in NPSPNOA3:

Precipitation data for each season and the yearly total for the years 1968, 1969, and 1970.

NPSPSTR1: This program will read a print image tape created by STORET and reformats the data onto an intermediate data file for sorting by NPSPSTR2. The sorted file will be read by NPSPSTR3 for updating the STATION MASTER FILE. The data will be selected from the STORET print image tape as described in Appendix C.

NPSPCOA3: This program reads the file created by NPSPCOA1, sorted by NPSPCOA2, and updates the COUNTY MASTER FILE. The fields specified under NPSPCOA1 are the only fields affected. The data reported on the Census of Agriculture file in acres were converted to square miles in NPSPCOA1.

NPSPCNI4: This program reads the files created in NPSPCNI2, sorted by NPSPCNI3, and updates the COUNTY MASTER FILE with the apposite data. The data fields affected are defined in NPSPCNI2. An error report will be printed reflecting CNI data for counties which do not exist on the COUNTY MASTER FILE.

NPSPGAL4: This program reads the files created by NPSPGAL1, sorted by NPSPGAL2, NPSPGAL3, and allocates county area, county area for the station and percent of county area for the station and writes the allocation data onto a magnetic tape which is sorted by NPSPGAL5 and used by NPSPGAL6. A report will be written reflecting the data generated with an "*" flagging any fields in error.

NPSPGAL6: This program reads the Zone Master created in NPSPGAL4, sorted into station sequence by NPSPGAL5 and accumulates the zone areas in each record. The sum of the zone areas by station will be the station area which will be written into each record. The output file will be a disk file to be sorted by NPSPGAL7 into county, state sequence.

NPSPCAL1: This program reads the allocation file created by NPSPGAL6, sorted by NPSPGAL7, and the COUNTY MASTER FILE. The allocation data for each county are used in generating the Zone Master File. An error report is written reflecting:

1. No allocations for county records, and/or

2. No counties for allocation records.

NPSPGSM3: This program reads the file created in NPSPGMF1 and the sorted file created by NPSPGSM2, and generates the STATION MASTER FILE. An error report is written for each station which does not have the necessary data.

NPSPCTS2: This program reads the Zone Master File created by NPSPCAL1, sorted by NPSPCTS1, and accumulates the zone records by station and writes the apposite county data to an intermediate data file in NPSPCTS3.

NPSPCTS3: This program reads the intermediate file created in NPSPCTS2 and updates the STATION MASTER FILE created in NPSPGSM3. An error report is written reflecting data for which a STATION MASTER record does not exist and STATION MASTER records without county data.

NPSPNOA3: This program reads the intermediate file created by NPSPNOA1, sorted by NPSPNOA2, and updates the COUNTY MASTER FILE. An error report

is written to show records selected for which a COUNTY MASTER record does not exist.

NPSPFPC3: This program reads the intermediate file created in NPSPFPC1, sorted by NPSPFPC2, and updates the COUNTY MASTER FILE. An error report is written reflecting the data selected for which a COUNTY MASTER record does not exist.

NPSPSTR3: This program reads the intermediate file created by NPSPSTR1, sorted by NPSPSTR2, and updates the STATION MASTER FILE. An error report is written for the data records for which no STATION MASTER record exists.

NPSPSTMD: This program reads the STATION MASTER FILE and creates a report for each MRI station in the Missouri River Basin. The report reflects the pertinent data within the following major categories:

1. Location

2. Land characteristics

3. Land use (acres)

4. Water quality data (averages)

5. Crop data

6. Fertilizer data (tons) and pesticide data (tons)

7. Livestock and poultry

8. Contributing counties (up to 100)

The data furnished within each of the above categories are as follows:

1. Location

    a. Stream name
    b. Location
    c. County
    d. State
    e. Latitude
    f. Longitude
    g. Downstream station
    h. Distance to downstream station
    i. MRI station number

j. STORET station and agency number
k. USGS station and agency number
l. OWDC WQ station number
m. OWDC SW station number
n. OWDC sub-subbasin number
o. Total watershed area

2. Land characteristics

a. Main channel slope (feet per mile)
b. Slope percent class (percentage slope for watershed)
c. Soil erosion class
d. Soil infiltration (inches per hour)
e. Soil index
f. Rainfall intensity (inches per 30 min)
g. Total precipitation in inches for each season and the year
h. Soil capability classes for the eight types

3. Land use (square miles)

a. Land area
b. Total cropland
c. Pasture/grazing
d. Woodlands
e. Irrigated
f. Other land in county
g. Harvested cropland
h. Other cropland
i. Other farmland
j. Land in farms

4. Water quality data (averages) for each season and the year, see Appendix C

5. Crop data (square miles)

a. Corn
b. Sorghum
c. Wheat
d. Other grains
e. Soybeans
f. Hay
g. Cotton
h. Peanuts

i. Tobacco
j. Potatoes
k. Vegetables
l. Berries
m. Orchards
n. Other crops
o. Greenhouses

6. Fertilizer data (tons) - by half year and pesticide data (tons) - by year

a. Total nitrogen
b. Total P_2O_5
c. Total K_2O
d. Lime
e. Herbicides
f. Insecticides
g. Fungicides

7. Livestock and poultry

a. Cattle and calves - total - feedlots - stock in lots
b. Hogs - total - hog lots - hogs in lots
c. Chickens - total - chicken houses - chickens in houses
d. Sheep
e. Horses and ponies

8. Contributing counties

a. Each county that shares in the watershed of this station will be listed showing the total county area, the county area in this station, percent of this county area to station area and the distance to the station.

NPSPCTYD: This program reads the COUNTY MASTER FILE and creates a report for each county in each state within the Missouri River Basin. The report reflects the pertinent data within the following major categories.

1. Location

2. Land characteristics

3. Land use

4. Crop data

5. Fertilizer data and pesticide data

6. Livestock and poultry

The data furnished within each of the above categories are as follows:

1. Location

   a. County
   b. State
   c. Watershed
   d. Land resource area
   e. Land resource region (see Appendix D)

2. Land characteristics

   a. Slope percent class (land slope for county)
   b. Soil erosion class
   c. Rainfall intensity (inches per 30 min)
   d. Total precipitation (all seasons and the year)
   e. Soil name
   f. Soil capability classes

3. Land use (square miles)

   a. Land area
   b. Total cropland
   c. Pasture/grazing
   d. Woodlands
   e. Irrigated
   f. Total farmland
   g. Other land in county
   h. Harvested cropland
   i. Other cropland
   j. Other farmland

4. Crop data (square miles)

   a. Corn
   b. Sorghum
   c. Wheat

d. Other grain
e. Soybeans
f. Hay
g. Cotton
h. Peanuts
i. Tobacco
j. Potatoes
k. Vegetables
l. Berries
m. Orchards
n. Other crops
o. Greenhouses

5. Fertilizer data (tons) by half year and pesticide data (tons) by year

a. Total nitrogen
b. Total P_2O_5
c. Total K_2O
d. Lime
e. Herbicides
f. Insecticides
g. Fungicides

6. Livestock and poultry

a. Cattle and calves - total - feedlots - stock in lots
b. Hogs - total - hog lots - hogs in lots
c. Chickens - total - chicken houses - chickens in houses
d. Sheep
e. Horses and ponies

APPENDIX A

MANUAL DATA CARD LAYOUT FORMS

JOB		WRITTEN AS								MRI
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NOTES State Code Numbers and Names 3572-001

FIELD IDENTIFICATION

Data Identification		Code Number	State Name	
1-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80
STATENAME.RDO1							

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NOTES County Area, Rainfall, Soil Type and Name

3572-002

FIELD IDENTIFICATION

Data Identification		State County code		Max 30mn 1 hour rain	2E-hE Soil Type	County Area	County Name	
		St.	Cty					
1-10	11-20	21-30		31-40		41-50	51-60	61-70	71-80
COUNTYADATA002								

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NOTES Station Location and Identification

3572-003

FIELD IDENTIFICATION

Data Identification	MRI Station Number	State	County Code	Latitude D	Latitude M	Latitude S	Long. D	Long. M	Long. S	Stream Name	Location Name
1-10	11-20	21-30		31-40			41-50			51-60	61-70 / 71-80
STATIONNO0CA003											

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NOTES Station Cross Reference List

3572-004

FIELD IDENTIFICATION

Data Identification	Nri Station Number	STORET Station Number		OWDC Water Quality Station	OWDC Surface Water Station	~~EPA~~ USGS	
		Station	Agency			Station	Agency
1-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80
STATNXREFAAAOOA							

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NOTES County Within Zone Definition 3572-005

FIELD IDENTIFICATION

Data Identification	MRI Station Number	County				County				County			
		St	Cty	Area	Dist	St	Cty	Area	Dist	St	Cty	Area	Dist
1-10 11-20		21-30		31-40		41-50		51-60		61-70		71-80	
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0													
COUNTY-ZONE005													

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NOTES Hydrological Sequence

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FIELD IDENTIFICATION

Data Identification	MRI Station Number	Downstream MRI Station Number	Mileage to Down Station	
1-10	11-20	21-30	31-40	41-50 51-60 61-70 71-80

DOWNSTASTAT 4006

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3572-007

MRI

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NOTES Zone Slope and Soil Characteristics

FIELD IDENTIFICATION

Data Identification	MRI Station Number	Main Channel Slope	Soil Infiltra. Rate	Soil Erode. Factor K	Map No.	Map L	
1-10	11-20	21-30	31-40	41-50	V	✓	51-60 / 61-70 / 71-80
SLOPE-SOILAA.007							

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NOTES Applied Fertilizer by County

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3572-00A

FIELD IDENTIFICATION

Data Identification		State County Code		Nitrogen	Phosphate	Potash	Total	
		St.	Cty					
1-10	11-20	21-30		31-40	41-50	51-60	61-70	71-80
FERTILIZER 008								

JOB	
BY	DATE

WRITTEN AS								
PUNCH AS								

MRI

PAGE ___ OF ___

NOTES Applied Pesticide by county

3572-009

FIELD IDENTIFICATION

Data Identification		State County Code		Herbicides	Insecticides	Fungicides		
		St.	Cty.					
1-10	11-20	21-30		31-40	41-50	51-60	61-70	71-80
PESTICIDE 009								

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BY	DATE	

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NOTES STATE AND COUNTY - NOAA Station Cross Reference

8572-013

FIELD IDENTIFICATION

		State and County		Station	Station	Station	Station	Station	Station	Station	Station	Station	Station
		St.	Cty.										
1-10	11-20	21-30		31-40		41-50		51-60		61-70		71-80	
NOAA-STAT	010												

APPENDIX B

IDENTIFICATION OF DATA BY SOURCE

Source	Field Name	Description
Manual Data	MRI Station Number	Card Type 3
	OWDC Map and Basin	Card Type 7
	State and County	Card Type 3
	State Name	Card Type 1
	County Name	Card Type 2
	Latitude and Longitude	Card Type 3
	Stream Name	Card Type 3
	Location Name	Card Type 3
	STORET Station and Agency	Card Type 4
	OWDC Water-Quality Station	Card Type 4
	OWDC Surface Water Station	Card Type 4
	USGS Station and Agency	Card Type 4
	Downstream Station	Card Type 6
	Distance to Downstream Station	Card Type 6
	Main Channel Slope	Card Type 7
	Soil Infiltration Rate	Card Type 7
	Soil Index (Erosion Factor)	Card Type 7
	County Code-Each County in Station	Card Type 5
	County Total Area - Each County in Station	Card Type 5
	County Distance to Station - Each County in Station	Card Type 5
	Rain Intensity	Card Type 2
	Nitrogen	Card Type 8
	P_2O5	Card Type 8
	K_2O	Card Type 8
	Herbicides	Card Type 9
	Insecticides	Card Type 9
	Fungicides	Card Type 9
Census of Agriculture (1969)	Land Area	
	Total Farmland	
	Total Other Land	
	Total Crop area	
	Pasture Grazing Cropland	
	Harvested Cropland	
	Other Cropland	

Source	Field Name	Description
	Woodlands	
	Irrigated Farmland	
	Other Farmland	
	Corn	
	Sorghum	
	Wheat	
	Other Grain	
	Soybeans	
	Hay	
	Cotton	
	Peanuts	
	Tobacco	
	Potatoes	
	Vegetables	
	Berries	
	Orchards	
	Other Crops	
	Greenhouses	
	Total Cattle	
	Cattle Feedlots	
	Cattle in Feedlots	
	Total Hogs	
	Hog Lots	
	Hogs in Lots	
	Sheep	
	Horses	
	Total Chickens	
	Chicken Houses	
	Chickens in Houses	
	Lime	
Conservation Needs Inventory (1969)	Soil Name	
	Slope Percent Class	
	Erosion Class	
	Soil Class area by class and index	
	Watershed	
	Resource Area	
	Resource Region (codes are listed in Appendix D)	
STORET	Parameter List from Appendix C	
NOAA (1968, 1969, 1970)	Rainfall	Amount for quarters and year

APPENDIX C

SELECTED WATER QUALITY PARAMETERS

Code	Parameter Description	Parameter Abbreviation
00010	Water Temperature (degree Centigrade)	TEMP CENT
00011	Water Temperature (degree Fahrenheit)	TEMP FAHN
00060	Stream Flow (cubic feet per second)	FLOW CFS
00070	Turbidity, Jackson Candle (Jackson Unit)	JURB, J.U.
00075	Turbidity, Hellige (ppm as silicon dioxide)	TURB PPMSIO2
00095	Conductivity (micromhos at 25°C)	CNDUTVY MO
00300	Dissolved Oxygen (mg/l)	DO MG/L
00301	Dissolved Oxygen (percent of saturation)	DO SAT PCT
00310	Biochemical Oxygen Demand (mg/l, 5-day-20°C)	BOD5 MG/L
00335	Chemical Oxygen Demand, 0.025N K_2CrO_7 (mg/l)	COD MG/L
00400	pH (standard unit)	PH SU
00500	Total Residue (mg/l)	T RSD MG/L
00505	Total Volatile Residue (mg/l)	TV RSD MG/L
00510	Total Fixed Residue (mg/l)	TFX RSD MG/L
00515	Total Filtrable Residue (mg/l)	TF RSD MG/L
00520	Volatile Filtrable Residue (mg/l)	VF RSD MG/L
00525	Fixed Filtrable Residue (mg/l)	FF RSD MG/L
00530	Total Nonfiltrable Residue (mg/l)	TNF RSD MG/L
00535	Volatile Nonfiltrable Residue (mg/l)	VNF RSD MG/L
00540	Fixed Nonfiltrable Residue (mg/l)	FNF RSD MG/L
00545	Settlable Residue (ml/l)	S RSD ML/L
00600	Total Nitrogen (mg/l as N)	T N MG/L
00605	Organic Nitrogen (mg/l as N)	OG N MG/L
00610	Ammonia Nitrogen (mg/l as N)	AM N MG/L
00615	Nitrite (mg/l as N)	NO2 MG/L N
00620	Nitrate (mg/l as N)	NO3 MG/L N
00630	Nitrite Plus Nitrate, One Determ. (mg/l as N)	NO2&3 MG/L N
00635	Ammonia & Organic Nitrogen, One Determ. (mg/l as N)	AM&OG N MG/L
00650	Total Phosphate (mg/l as PO_4)	T PO4 MG/L
00655	Poly Phosphate (mg/l as PO_4)	PL PO4 MG/L
00660	Ortho Phosphate (mg/l as PO_4)	OT PO4 MG/L
00665	Total Phosphorus, Wet Method (mg/l as P)	T P MG/L
00666	Diss. Phosphorus, Wet Method (mg/l as P)	D P MG/L
00667	Insoluble Phosphorus (mg/l as P)	I P MG/L
00670	Total Organic Phosphorus (mg/l as P)	T OG P MG/L
00930	Dissolved Sodium (mg/l as N_a)	D NA MG/L
00931	Sodium Adsorption Ratio	NA ADS RATIO
00935	Dissolved Potassium (mg/l as K)	D K MG/L
00936	Suspended Potassium (mg/l as K)	SUS K MG/L

Code	Parameter Description	Parameter Abbreviation
00937	Total Potassium (mg/l as K)	T K MG/L
00940	Chloride (mg/l as Cl)	CL MG/L
31501	Total Coliform (membrane filter, immed., M-Endo Med, 35°C, /100 ml)	T CLF1/100 ML
31503	Total Coliform (membrane filter, delayed, M-Endo Med, 35°C, /100 ml)	T CLF2/100 ML
31504	Total Coliform (membrane filter, immed., Les Endo Agar, 35°C, /100 ml)	T CLF3/100 ML
31615	Fecal Coliform (MPN, EC Med., 44.5°C, tube. 31614, /100 ml)	F CLF1/100 ML
31616	Fecal Coliform (membrane filter, M-FC Broth, 44.5°C, /100 ml)	F CLF2/100 ML
31673	Fecal Streptoccoci (membrane filter, KF Agar, 35°C, 48 hr, /100 ml)	F STC1/100 ML
31679	Fecal Streptoccoci (MF M-Enderoccocus Agar, 35 C, 48 hr, /100 ml)	F STC2/100 ML
38260	Methylene Blue Active Substance	MBAS MG/L
70299	Suspended Solids (Residue on Evap. at 180 C, mg/l)	SS MG/L
70300	Total Filtrable Residue (dried at 180 C, mg/l)	TF RSD MG/L
70302	Dissolved Solids - Tons per Day	DS TONS/DAY
70303	Dissolved Solids - Tons per Ac-Ft	DS TONS/A-FT
70324	Suspended Sediment (mg/l)	SUS SED MG/L
71845	Ammonia Nitrogen (mg/l as NH_4)	AM MG/L NH4
71850	Nitrate (mg/l as NO3)	NO3 MG/L
71855	Nitrite (mg/l as NO_2)	NO2 MG/L
71886	Total Phosphorus (mg/l as PO_4)	TP MG/L PO4
71887	Total Nitrogen (mg/l as NO3)	TN MG/L NO3
71888	Total Soluble Phosphorus (mg/l as PO4)	TSP MG/L PO4
71889	Soluble Orthophosphate (mg/l as PO_4)	SO PO4 MG/L

The concentration of insecticides, as denoted by INSECTICIDES in the Data Report, was taken as the average concentration in whole water sample (µg/l) of the following parameters:

Code	Parameter
39330	Aldrin
39340	BHC
39350	Chlorodane
39360	DDD
39365	DDE
39370	DDT
39380	Dieldrin
39388	Endosulfan
39390	Endrin
39398	Ethion
39400	Toxaphene
39410	Heptachlor
39420	Heptachlor Epoxide
39430	Isodrin
39440	NHX
39450	NHP
39460	Chlorobenzilate
39470	Dilan
39480	Methoxychlor
39530	Malathion
39540	Parathion
39550	Chlorothion
39560	Demeton
39570	Diazinon
39580	Guthion
39590	Hept
39600	Methyl Parathion
39610	Phosdrin
39620	Tepp
39750	Sevin
39780	Dicofol
39782	Lindane
39786	Trithion
39790	Methyl Trithion
39800	Imidan
39900	Allethrin
39910	Cinerin
39930	Pyrethrins

The concentration of herbicides, as denoted by HERBICIDES in the Data Report, was the average concentration of the following parameters in the whole water sample, with unit µg/l:

Code	Parameter
39730	2,4-D
39740	2,4,5-T
39760	Silvex
39770	Dacthal (DCPA)
39920	DNOC

APPENDIX D

LAND RESOURCE REGION CODES

Region Symbol	Physiographic Region
A, C	Pacific Coast
B	Columbia River Basin
D	Southwestern Basins and Mountains and Colorado Plateau and Mountains
F	Rocky Mountains
F, G, H	Great Plains
I, J, P, O, T, U	Atlantic and Gulf Coastal Plains
N, R, S	Appalachian Ozark Highlands
K, L, M	Central Basin